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CERTIFICATE

This certificate is issued in support of an application for Patent registration in a country outside New Zealand pursuant to the Patents Act 1953 and the Regulations thereunder.

I hereby certify that annexed is a true copy of the Provisional Specification as filed on 30 September 2002 with an application for Letters Patent number 521694 made by CO2 PAC LIMITED.

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Dated 1 October 2003.

Neville Harris
Commissioner of Patents, Trade Marks and Designs

COMMISSIONER OF PATENTS, TRADEMARKS & DESIGNS
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521694

Patents Form No. 4

Our Ref: MH504102

Patents Act 1953

PROVISIONAL SPECIFICATION

HOT-FILL CONTAINER

We, **CO2 PAC LIMITED**, a New Zealand company, of 88-90 Balmoral Road, Mt Eden, Auckland, New Zealand do hereby declare this invention to be described in the following statement:

PT0431557

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30 SEP 2002

Hot-Fill Container

Background To The Invention

The present invention relates to a hot-fill container which is a development of the hot-fill container described in our international application WO 02/18213 (the PCT specification), which specification is incorporated herein in its entirety where appropriate.

The PCT specification backgrounds the design of hot-fill containers and the problems with such designs which were overcome or at least ameliorated by the design of our PCT specification.

In that PCT specification a semi-rigid container was provided which had a side wall with at least one substantially vertically folding vacuum panel portion. That vacuum panel portion included an initiator portion and a control portion which resisted being expanded from the collapsed state.

We described in our PCT specification the inclusion of the vacuum panels at various positions along the container side wall.

One problem with including the vacuum panels in the upper side wall is that this can impose constraints on the overall container design. For example it makes it difficult to replicate a clear wall glass container with a hot-fill plastic container.

Objects of the Invention

It is an object of the present invention to provide a hot-fill plastics container which is able to provide an improved option for container design while dealing with the problems inherent in hot-fill containers and/or to at least provide the public with a useful choice.

Summary of the Invention

According to one aspect of the present invention there is provided a hot-fill plastics container, a side wall of which has at least one substantially vertically folding vacuum

panel portion including a control portion which resists being expanded from the collapsed state, and wherein the said at least one vacuum panel portion is provided at or adjacent a bottom portion of said side wall so that after folding, the vacuum panel portion forms part of a base portion of the container.

Possibly, the vacuum panel portion may include an initiator portion.

Preferably the vacuum panel portion includes an upper portion which after folding of the vacuum panel portion provides a replacement container standing support.

Preferably the container as defined in the paragraph immediately above, includes a recess or instep to enable the panel portion to fold inwardly relative to the container and upwardly relative to the base portion.

According to a further aspect of this invention there is provided a hot-fill container substantially as herein described with reference to the accompanying drawings.

According to a further aspect of the invention a container forming means for a hot-fill plastics container as defined in the fifth paragraph above includes a force providing means which acts to push the base portion of the container after hot-filling to facilitate folding.

Further aspects of the invention which should be considered in all its novel aspects will become apparent from the following description.

Brief Description Of Drawings

Figure 1: shows very diagrammatically a cross-sectional view of a hot-fill container according to one possible embodiment of the invention its pre-collapsed condition;

Figure 2: shows the bottle of Figure 1 in its collapsed position;

Figure 3: shows the base of Figure 1 before collapsing;

Figure 4: shows the base of Figure 2 following collapsing;

Figure 5: shows very diagrammatically an underneath view of the base of the container of Figures 1 and 2 before collapsing.

Description Of Possible Embodiments

The present invention relates to hot-fill containers. Typically at a bottling plant the containers will be filled with a hot liquid and then capped before being subjected to a cold water spray resulting in the formation of a vacuum within the container which the container structure needs to be able to cope with.

As mentioned above and in our earlier PCT specification, various proposals for hot-fill container designs have been put forward.

We have further developed the hot-fill container of our PCT specification by moving the one or more vacuum panels to a bottom portion of the side wall so that following folding the vacuum panel forms part of the container base portion. This development has at least two important advantages.

Firstly, this means that there are no design features being imposed on the major portion of the side wall of the container in order to incorporate the vacuum panels. If required therefore the major portion of the side wall of the present invention could have no structural features and the container could, if required, replicate a clear wall glass container.

Secondly, by providing the vacuum panel so as to form part of the base after folding, a mechanical force could be now provided, such as by a mechanical pusher, which would engage with the container base in resetting the container shape thereby increasing the design options for an initiator portion if so required

Further, by providing the vacuum panel so as to form part of the base after folding, and a mechanical force to resetting the container shape, the initiator portion may provide further support for the latching effect of the control portion to enhance the locking of the control portion such that it will not revert to its original position.

Further, by providing the vacuum panel so as to form part of the base after folding, the container base may assume a much wider 'footprint' which enhances vertical stability of the container after it has been labelled and is released for commercial distribution.

Previously, the positioning of a vacuum panel at the lower portion of a side wall may have been dismissed as being unworkable in compromising vertical stability, although such an option was within the ambit of the PCT specification.

Still further, by providing the vacuum panel so as to form part of the base after folding, a mechanical force could be now provided, such as by a mechanical pusher, which would engage with the container base in resetting the container shape prior to the filling of the container with a suitable liquid, such that the container could be used for so called 'retort' situations, or the like, whereby the container is capped and a heating source applied. The resulting build-up of heat within the container causes a build-up of pressure also. This pressure build-up may then cause the properly calibrated control portion to revert back to its original position until the container cools again, thereby removing the internal pressure. The provision of the vacuum panel therefore reduces significantly the stress on the container sidewalls and allows advantageously less material to be used in the container construction.

Referring to the accompanying drawings, Figure 1 shows, by way of example only, a container in the form of a bottle. This is referenced generally by arrow 10 with a typical neck portion 12 and a side wall 9 extending to a bottom portion of 11 of the side wall and an underneath base portion 2.

The container 10 will typically be blow moulded from any suitable plastics material but typically this will be polyethylene tetraphalate (PET).

The base 2 is shown provided with plurality of reinforcing ribs 3 so as to form the typical "champagne" base although this is merely by way of example only.

In Figure 2 the lower side wall portion 11 is shown having folded inwardly so that a ring or annular portion 6 positioned in Figure 1 above the level of the bottom of the base 2 is now forming a new standing ring or support 6 for the container 10.

To assist this occurring and as will be seen particularly in Figures 3 and 4, immediately adjacent the ring or annular portion 6 there may be an instep or recess 8 which after folding of the bottom portion 11 enables base 2 to effectively completely disappear above the annular portion 6.

Referring now particularly to Figure 5 the base 2 with its strengthening ribs 3, is shown surrounded by the bottom portion 11 of the side wall 9. The bottom portion 11 is shown in this particular embodiment as having an initiator portion 1 which forms part of the collapsing or inverting section which yields to longitudinally directed collapsing force before the rest of the collapsing or folding section. The base 2 is shown provided within the typical base standing ring 4 which will be the first support position for the container 10 prior to vacuum removal after the inversion of the folding panel.

Associated with the initiator portion 1 is a control portion 5 which is a more steeply angled inverting section which will resist expanding from the collapsed state.

Forming the outer perimeter of the bottom portion 11 of the side wall 9 is shown the side wall standing ring or annular portion 6 which following collapsing of the panel 11 will provide the new container support.

As mentioned previously, it is envisaged that in possible embodiments of this invention the initiator portion 1 may be omitted so that in the embodiment shown in Figure 5 for example the control portion 5 would then provide essentially a continuous conical area about the base 2.

In such an embodiment, or even if an initiator portion was still provided, following the filling and capping of the bottle 10 and the use of cold water spray creating the vacuum within the filled bottle 10, a force could be imposed on the folding panel 11 such as by means of a mechanical pusher or the creation of some relative movement of the bottle base relative to a punch or the like, whereby the bottle shape was then reset to its folded or collapsed state such as shown in Figure 2.

It will be seen that by the provision of the folding portion in the bottom of the side wall 9 of the container 10 the major portion of the side wall 9 could be absent any structural features so that the container 10 could essentially replicate a glass container if this was required.

Although one particular structure for the bottom portion of the side wall 9 is shown in the accompanying drawings it will be appreciated that alternative structures could be provided. For example a plurality of folding portions could be incorporated about the base 2 in an alternative embodiment. By way of further example, the instep 8 may be recessed to such an extent that the entire lower sidewall portion and base are substantially or completely contained horizontally above the standing ring 6 even prior to folding of the vacuum panel.

Where in the foregoing description, reference has been made to specific components or integers of the invention having known equivalents then such equivalents are herein incorporated as if individually set forth.

Although this invention has been described by way of example and with reference to possible embodiments thereof, it is to be understood that modifications or improvements may be made thereto without departing from the scope or spirit of the invention.

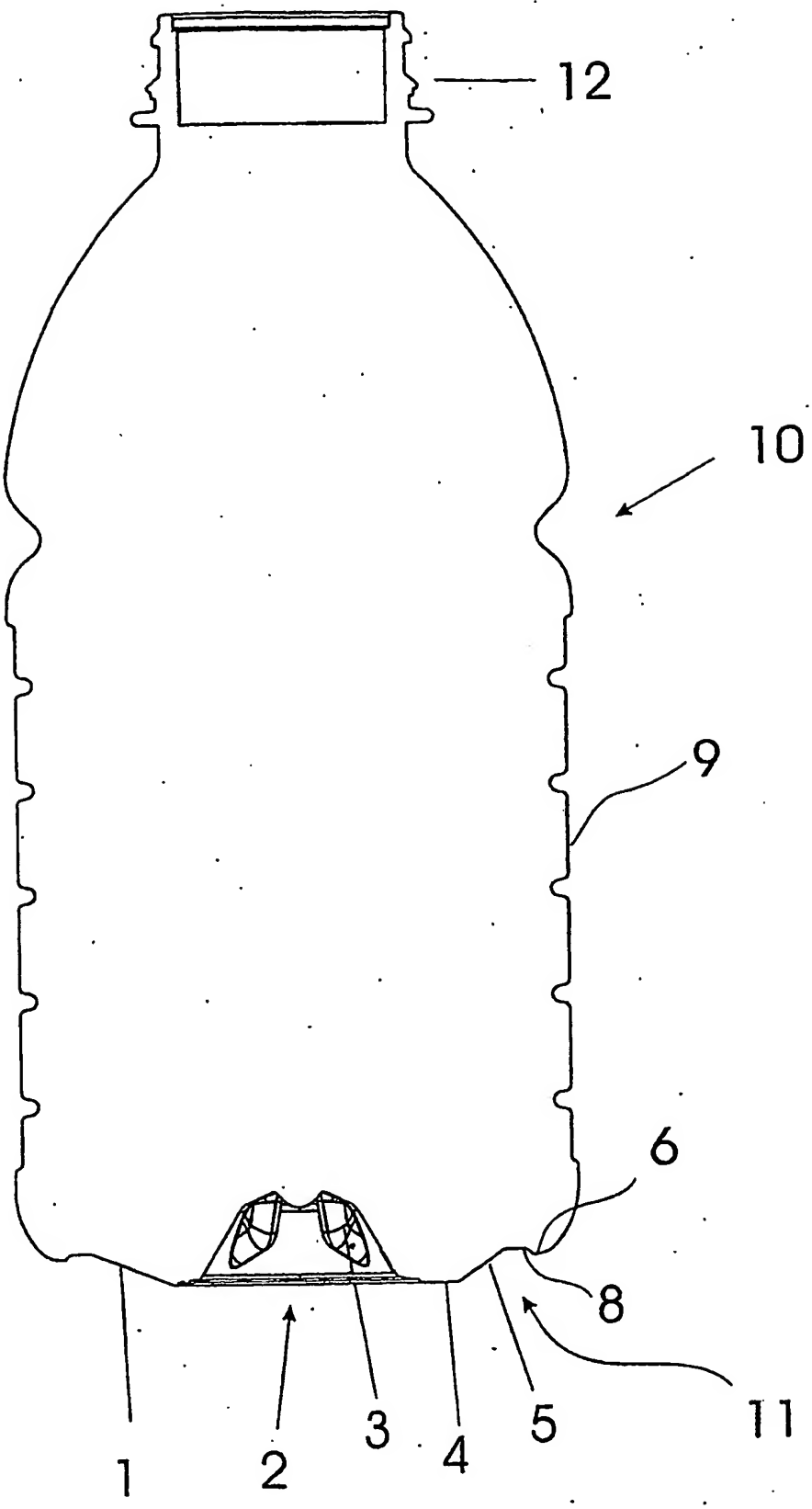

FIG 1

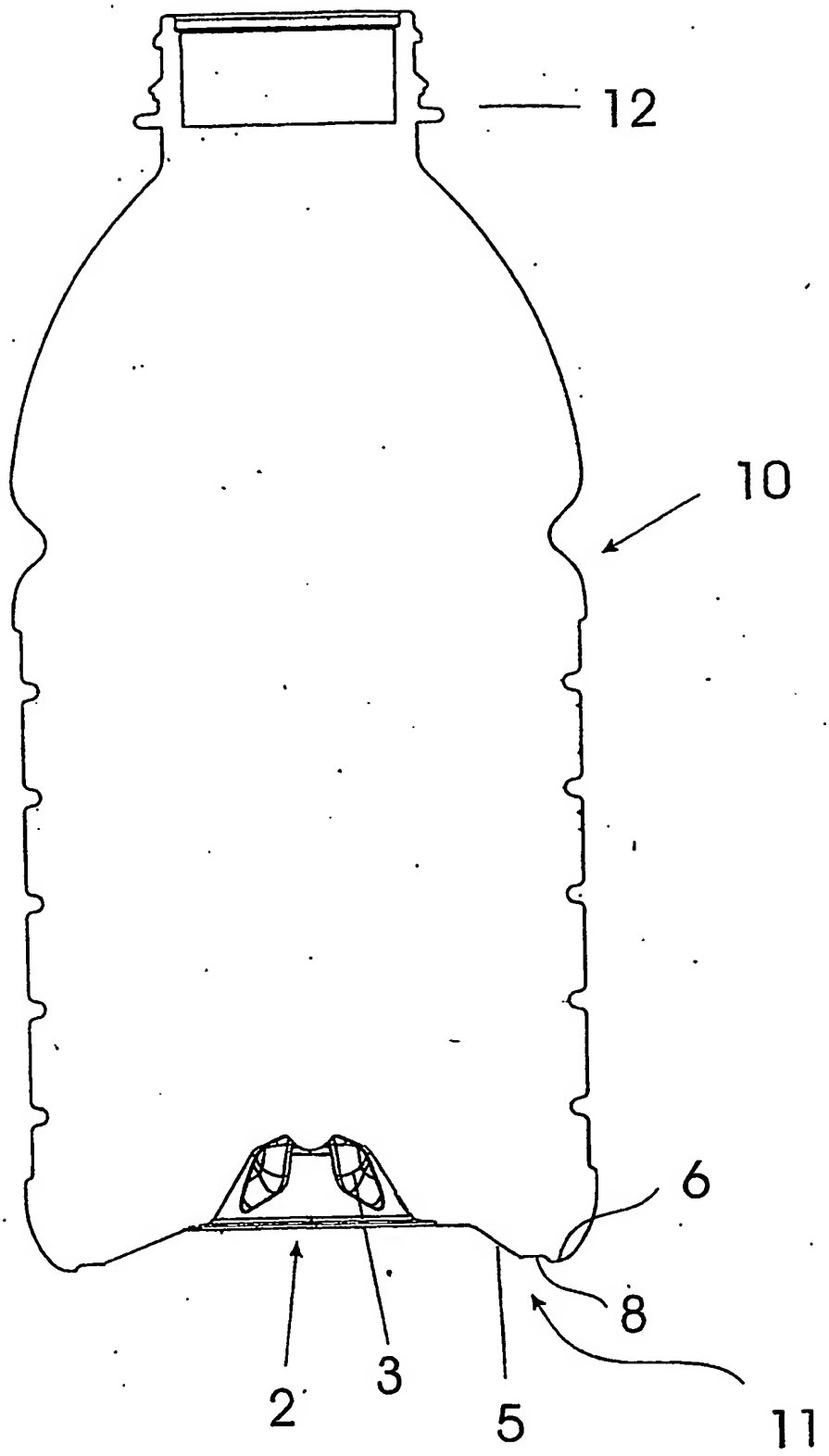

FIG 2

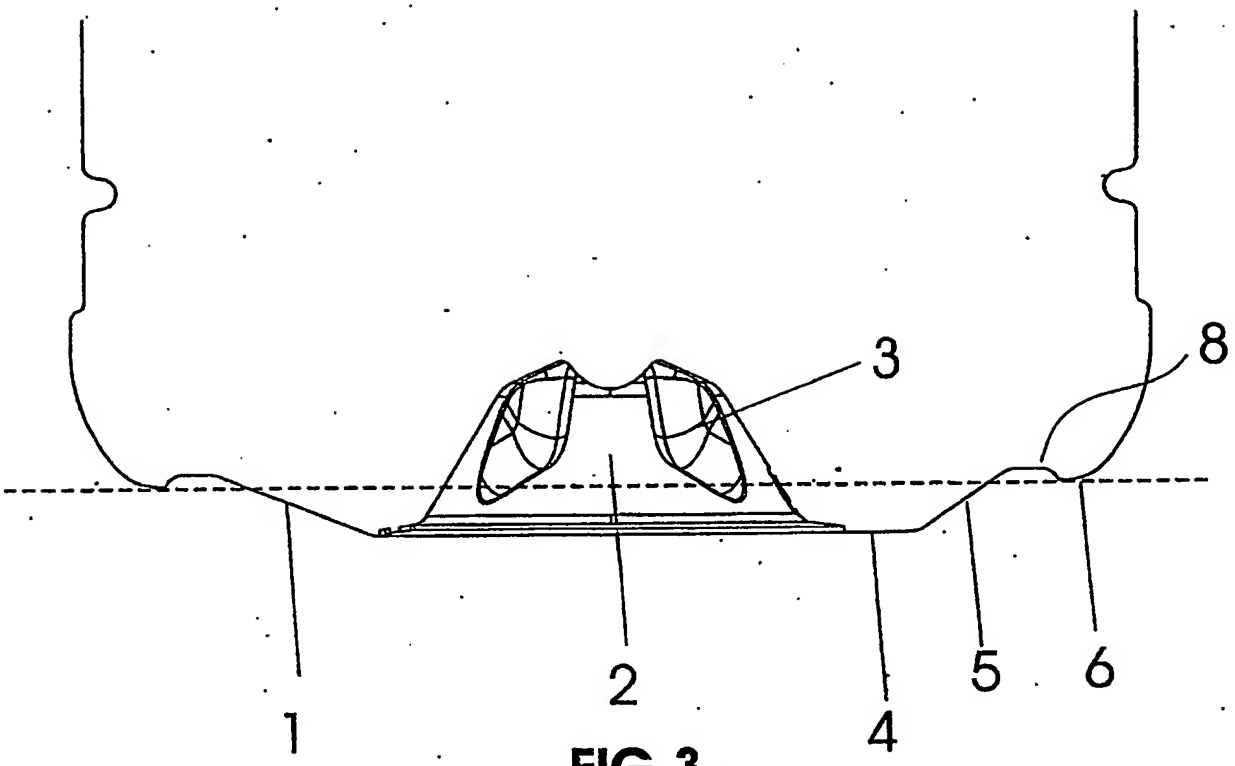

FIG 3

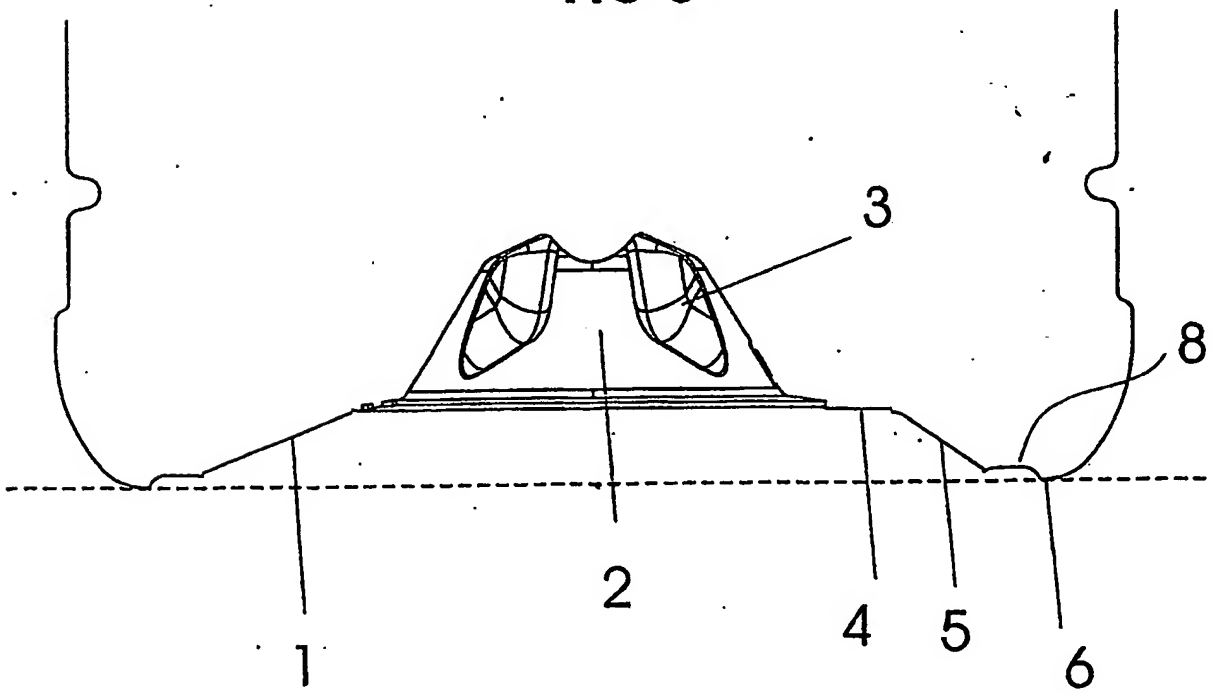

FIG 4

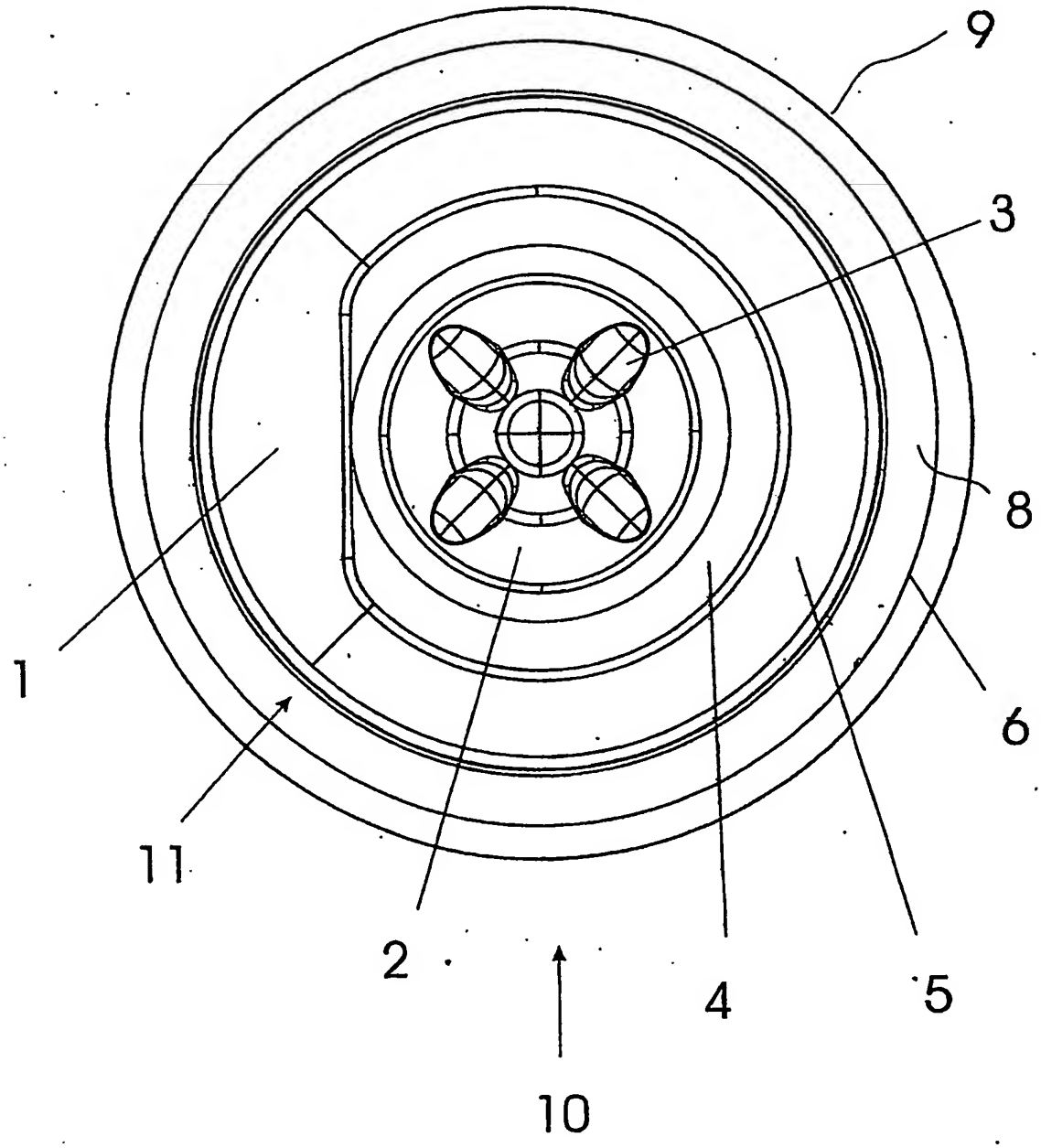

FIG 5

Patents Form No. 5

Our Ref: MH504102

NEW ZEALAND
PATENTS ACT 1953

Complete After Provisional No. 521694
Filed: 30 September 2002
COMPLETE SPECIFICATION

CONTAINER STRUCTURE FOR REMOVAL OF VACUUM PRESSURE

We, **CO2 PAC LIMITED**, a New Zealand company of 88-90 Balmoral Road, Mt Eden, Auckland, New Zealand

hereby declare the invention, for which We pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:

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30 SEP 2003
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CLAIMS:

1. A container having a longitudinal axis, an upper portion having an opening into said container, a body portion extending from said upper portion to a base portion, said base portion closing off an end of said container, said container having at least one substantially transversely oriented pressure panel portion located in said base portion, said pressure panel portion being capable of folding from one longitudinally inclined position to an inverted position to compensate for a change of pressure induced within the container, said pressure panel portion including an initiator portion and a control portion, said initiator portion having less resistance to pressure folding forces and providing for folding before the control portion.

2. A container as claimed in claim 1 wherein said pressure panel portion is adapted to resist being expanded from the inverted position.

3. A container as claimed in claim 1 wherein the initiator portion has a less acute angle than the control portion relative to the longitudinal axis.

4. A container as claimed in claim 3 wherein the initiator portion causes said control portion to invert and flex further inwardly into the container.

5. A container as claimed in claim 1 wherein said pressure panel portion provides compensation of vacuum pressure induced, in use, within the container following cooling of a heated liquid within the container after it has been capped, such that there remains substantially no vacuum pressure inside the container.

6. A container as claimed in claim 5 wherein said pressure panel portion is adapted in use to invert longitudinally under an externally applied mechanical force.

7. A container as claimed in claim 1 wherein said initiator portion is located adjacent to the widest periphery of the pressure panel portion.

8. A container as claimed in claim 1 wherein said pressure panel portion is of variable width and inverts from its widest portion to its narrowest portion.

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9. A container as claimed in claim 8 wherein said initiator portion has an angular inclination relative to said longitudinal axis which is substantially the same as that of the control portion.

10. A container as claimed in claim 1 wherein said pressure panel portion is adapted to cause said base to retract longitudinally further into said body portion.

11. A container as claimed in claim 10 wherein said pressure panel portion is adapted to cause a lowest portion of said base portion to be replaced as the structure providing a standing support for the container.

12. A container as claimed in claim 11 wherein its structure is such that in use a top load applied to the container is transferred from said base to a portion of a sidewall of the container.

13. A container as claimed in claim 1 wherein said pressure panel portion is connected with a lower portion of a sidewall of the container by a decoupling or hinge structure.

14. A container as claimed in claim 1 wherein said pressure panel portion includes outwardly projecting portions.

15. A container as claimed in claim 1 wherein said pressure panel portion includes inwardly projecting portions.

16. A container as claimed in claim 1 wherein said pressure panel portion is adapted in use to remove vacuum induced, in use, in the container such that substantially no vacuum remains.

17. A container as claimed in claim 3 wherein said control portion is outwardly inclined at an angle of more than 10° relative to a plane orthogonal to said longitudinal axis.

18. A container as claimed in claim 17 wherein said angle is between 30° and 45° and the angle of the initiator portion is at least 10° less.

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19. A container as claimed in claim 1 wherein said base portion further includes a substantially centrally located upwardly projecting further base portion joined adjacent to an inside border of the pressure panel and closing off a bottom of the container.

20. A container as claimed in claim 19 wherein said upwardly projecting further base portion is adapted to move upwardly when the pressure panel inverts.

21. A container as claimed in claim 1 wherein said pressure panel portion is adapted in use to provide compensation for internal pressure induced within the container following heating of a liquid within said container after it has been capped.

22. A container as claimed in claim 21 wherein said pressure panel portion is adapted in use to subsequently provide compensation for reduced pressure induced within the container following cooling of said liquid within the capped container, such that less force is exerted on the internal walls of said container.

23. A container as claimed in claim 1, said container having at least one substantially transversely oriented vacuum panel portion within said base, said vacuum panel portion being adapted in use to fold from a longitudinally inclined position to an inverted position to compensate for a change of pressure induced within the container following cooling of a liquid within the container after it has been capped, such that less force is exerted on the walls of said container.

24. A container as claimed in claim 1 wherein a single substantially transversely oriented vacuum panel portion is located within the base and is joined to a side wall of the container by a decoupling or hinge structure, said vacuum panel portion being adapted in use to fold from a longitudinally inclined position to an inverted position to compensate for a change of pressure induced within the container.

25. A container as claimed in Claim 1 in which the pressure panel portion includes a plurality of flutes forming a conical area in the base.

26. A container as claimed in claim 25 in which alternate flutes are inclined at a greater or lesser angle relative to the longitudinal axis.

27. A container as claimed in claim 25 in which the flutes are outwardly convex.

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28. A container as claimed in claim 25 in which the flutes are inwardly concave.

29. A container as claimed in Claim 1 and further including a standing ring surrounding said pressure panel for providing container stability when the pressure panel is in an inverted position.

30. A container as claimed in Claim 29 and further including a recessed instep adjacent to an inside border of said standing ring, said instep surrounding the pressure panel portion and being displaced higher within the container than an upper border of the pressure panel.

31. A container as claimed in Claim 1 whereby the pressure panel has no strengthening ribs to restrain substantial longitudinal movement and inversion.

32. A method of compensating for a change in pressure induced within a container according to claim 1 in which said method includes applying a force to the or each said pressure panel portion to cause said folding to occur.

33. A container as claimed in claim 29 and further including a recessed instep adjacent to an inside border of said standing ring, and a decoupling structure connecting an adjacent widest border of the pressure panel portion with said instep, said decoupling structure providing for greater inward and upward longitudinal movement of the pressure panel.

34 A container as claimed in claim 33 wherein said decoupling structure is relatively flat when compared to the longitudinal axis.

35. A container as claimed in claim 33 wherein said decoupling structure is relatively non-ribbed, and separates the widest point of the pressure panel from said recessed instep.

36. A container substantially as herein described with reference to any one of the embodiments of the invention as shown in the accompanying drawings.

END OF CLAIMS

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